GENERAL WORKPLAN FOR *BUILDING DEMOLITION* AT THE LIBBY, MONTANA, SUPERFUND SITE

Revision 2

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Prepared by

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Region 8

Denver, CO

With Technical Assistance from:

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APPROVAL PAGE

This General Work Plan has been prepared by the U.S. Environmental Protection Agency, Region 8, with technical support from Syracuse Research Corporation and CDM. The general strategy described is approved for use for building demolition activities in Libby.

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DOCUMENT REVISION LOG

Revision	Date	Primary changes
0	05/04/2005	--
1	09/29/2006	Optimization of Data Quality Objectives and study design. Addition of pre- and post-demolition activities, dust suppression (i.e., wetting requirements), and engineering control and evaluation sampling to Section 3. Clarification of real-time monitoring requirements.
2	05/17/2007	Revision to dustfall and air sample collection and analysis frequency.

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GENERAL WORK PLAN FOR BUILDING DEMOLITION AT THE LIBBY, MONTANA, SUPERFUND SITE

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is currently investigating and addressing potential human health risks from the presence of an amphibole form of asbestos in Libby, Montana, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as Superfund. This form of asbestos is referred to as Libby Amphibole (LA).

When LA contamination is located in or around a home or business in Libby, the most appropriate response depends on the level and extent of contamination, the probability of human exposure, and the feasibility of the various alternatives for dealing with the contamination. In most cases, the preferred clean-up option is removal of the contaminated source material (insulation, soil, dust) that may be posing an unacceptable health risk at that location. However, if a building is in poor condition, removal of source material may be unsafe. In this special case, demolition of the structure may become the only alternative.

When a building that contains asbestos is demolished, there is the possibility that asbestos (including not only LA, but also chrysotile and possibly other forms of asbestos used in building materials) could be released to the air, potentially causing exposures of workers or nearby residents, and potentially causing contamination of nearby properties. Under the authority of the Clean Air Act, the EPA has established a set of National Emission Standards for Hazardous Air Pollutants (NESHAPs), including regulations that apply to the release of asbestos during building demolition (CFR 61, Subpart M, Section 61.145). In brief, before demolition occurs, regulated asbestos-containing materials (RACM) are removed from the building if: a) they are friable or otherwise subject to airborne release during demolition, and b) are present in amounts that exceed minimum promulgated levels. Following removal of the RACM, the building is demolished, using water to wet the debris and limit the release of dust into the air. In cases where the building is not safe for entry, removal of RACM prior to demolition is not required.

When building demolition is performed as part of a removal action at a Superfund site under the authority of CERCLA, the NESHAPS regulations are considered to be an Applicable or Relevant and Appropriate Requirement (ARAR). Therefore, whenever a building demolition is performed at Libby, EPA will comply with the substantive requirements of the NESHAPS regulations. However, because it is expected that demolition at Libby will only be employed in cases where the building is unsafe, or removal of asbestos would be unsafe, it is likely that asbestos will be left in place in most buildings that undergo demolition.

Because of this, EPA will utilize engineering controls to minimize the release of LA, chrysotile, or any other asbestos to the environment during demolition projects in Libby.

This document provides a generalized description of the engineering controls that will be used, along with a generalized monitoring approach for assessing potential environmental impacts resulting from any releases that may occur during demolition activities.

Note that this document is not intended to serve as a detailed work plan for the demolition of any specific building. Rather, a site-specific work plan will be developed for each specific demolition activity, and that work plan will include all project-specific details.

2.0 DATA QUALITY OBJECTIVES

EPA has developed a seven-step Data Quality Objectives (DQO) procedure that is designed to ensure that data collection plans are carefully thought out and to maximize the probability that the results of the effort will be adequate to support decision-making. Application of this seven-step procedure to this project are presented below.

Step 1. State the Problem

Demolition of a building that contains asbestos can result in a release of asbestos to the environment. However, the magnitude and extent of any such release can not be predicted for such situations due to the inability to fully assess the nature of the interior contamination and the highly variable relationship between disturbance of contaminated source materials and the resultant release of airborne asbestos fibers.

Step 2. Identify the Decision

In general, two decisions will be made at each demolition site:

- Did the demolition activity cause releases of asbestos to outdoor air that would be of concern to near-by residents or workers?
- Did the demolition activity cause releases of asbestos to outdoor soil or indoor dust that are large enough to warrant characterization and potential removal actions at off-site locations, in accord with the decision criteria described in the December 2003 EPA Technical Memorandum (EPA 2003)?

Step 3. Identify Inputs to the Decision

Data needed to make these decisions consist of accurate and reliable measurements of the increase in asbestos levels in outdoor air, outdoor soil, and indoor dust levels that may occur as a result of the demolition.

For outdoor air, the level of increase is based on the difference between measured levels of LA, chrysotile, or other forms of asbestos in air near the demolition activity, and measured levels of asbestos in reference samples of outdoor air that are not influenced by the demolition activity. This will include reference samples collected near the demolition site but at times preceding and following demolition, and at locations removed from the demolition activities but on the same days as demolition. Comparison of outdoor air samples collected at the site during demolition activities with these two types of reference samples will help characterize both spatial and temporal variability in reference levels of asbestos in outdoor air at the time of the demolition.

For outdoor soil or indoor dust, the measure of increase due to demolition might be based on the difference in measurements of LA, chrysotile or other forms of asbestos taken before and after the demolition. However, as discussed in greater detail below (see Section 3.4.5), small changes in the concentration of LA in soil or indoor dust are difficult to measure using current analytical methods. Therefore, impacts of the demolition on outdoor soil and indoor dust will be evaluated using settled dust monitors to measure the amount of LA, chrysotile, and other forms of asbestos that are deposited from air to outdoor soil or indoor dust during the demolition, as detailed in SOP SRC-LIBBY-06. This approach provides the greatest sensitivity and accuracy for evaluating potential contamination of outdoor and indoor surfaces due to airborne releases of asbestos during to demolition activities.

Determination of "background" outdoor dustfall rates (i.e., asbestos fallout not due to demolition activities) will be based on outdoor dustfall measurements collected on the same day but at the remote reference locations, as well as near the site but on days before and after demolition. Determination of background indoor dustfall rates will be based on measurements collected at the same locations (i.e., in nearby homes or workplaces) as are monitored during demolition, but on days before and after demolition occurs.

Step 4. Define the Study Boundaries

The primary zone of interest around each demolition site is the area where dust releases from demolition activities are most likely to be deposited and cause potential contamination. The size and location of the zone may vary from site to site, depending on the size of the building being demolished, the direction and speed of the wind, and the location and proximity of adjacent structures. However, in general, the zone of chief interest will extend outward from the demolition site for about 300 feet[1].

Step 5. Develop a Decision Rule

Outdoor Air

The decision rule for outdoor air is:

> If the demolition activity does not cause levels of LA, chrysotile, or other forms of asbestos in outdoor air at the perimeter of the property to increase by more than

[1] This value has been optimized from 500 feet which was originally recommended in the previous version of this Sampling and Analysis Plan (SAP) [EPA 2005]. Lacking any empirical data, the original number (500 feet) was selected to be conservative. Data from initial demolition sites at Libby indicate that LA fibers are found at a maximum of about 200 feet from the demolition site. The 300 foot requirement continues to build in an allowance for uncertainty, but the distance requirement may be further optimized as additional data for demolitions at Libby become available.

0.5% of the level that is estimated to be of potential health concern for short-term (1 week) exposure, then it will be concluded that the various measures employed to control asbestos releases to outdoor air were effective at this site. Conversely, if the demolition activity causes increases in asbestos levels in air at the perimeter of the property that exceed 0.5% of the short-term (1-week) level of concern, it will be concluded that additional measures to minimize airborne releases or reduce potential human exposures during demolition activities are needed.

The choice of an increment of 0.5% of the total lifetime risk is based on the recognition that residents in Libby may be exposed to LA by multiple pathways, so the amount of exposure resulting from the demolition must be limited to only a small fraction of the total.

As discussed in the December 2003 Technical Memorandum (EPA 2003), the level of concern in air for short-term exposures may be approximated by dividing the level of concern for lifetime exposure by the fraction of a lifetime in which the exposure occurs. In this case, it will be conservatively assumed that the exposure from a demolition activity would occur 8 hours per day for 5 days (this is considered to be a high end estimate, since most demolitions occur within 1-2 days). Thus, the fraction of a lifetime represented by the demolition exposure is:

$$\text{Fraction of lifetime} = 8/24 \cdot 5/365 \cdot 1/70 = 0.000065$$

As discussed in the December 2003 Technical Memorandum (EPA 2003), the concentrations of LA in air that corresponds to a lifetime excess risk of 1E-04 depends on the risk model used, as follows:

Risk Model	Fiber Type (a)	Unit Risk for lifetime exposure	Concentration Corresponding to a risk of 1E-04	Fraction of Total TEM Structures (b)	Lifetime Level of Concern (1E-04) (Total ISO LA s/cc)
IRIS (2006)	PCM	0.23	4.3E-04 PCM s/cc	0.45	9.7E-04
Aeolus (2003)	BCPS	6.3 (c)	1.6E-05 BCPS/cc	0.040	4.0E-04

(a) PCM = phase contrast microscopy (length > 5 um, thickness ≥ 0.25 um, aspect ratio ≥ 3:1)
BCPS = "Berman-Crump protocol structure" (length > 10 um, thickness < 0.4 um)
(b) Fraction of total ISO 10312 structures that meet the definition of the risk models. Values shown are based on a download of the Libby2 database on 09/01/06.
(c) Value shown is based on amphibole asbestos

Based on this, 0.5% of the levels of concern in outdoor air at or beyond the perimeter of the property for a 1-week demolition project are as follows:

Risk Method	Reference Value for Evaluating Effects of Demolition Activities on Outdoor Air (Total ISO LA s/cc)
IRIS (2006)	0.074
Aeolus (2003)	0.031

Note that these values should be used to assess the <u>average</u> increase in LA in perimeter or off-site air during the demolition project, rather than on a by-sample basis.

Outdoor Soil and Indoor Dust

The decision rule for outdoor soil and indoor dust is:

> If the demolition activity does not result in increments in LA concentrations in outdoor soil or indoor dust that are larger than 5% of the action levels set forth under the December 2003 Technical Memorandum (EPA 2003), then it will be concluded that the demolition did not cause any releases that warrant further evaluation. Conversely, if the increment in LA concentrations in outdoor soil and/or indoor dust do exceed 5% of the trigger levels for soil or dust set forth under the December 2003 Technical Memorandum, then it will be necessary to characterize soil and/or dust at the potentially impacted properties and potentially implement clean-up actions in accord with the decision rules specified in the December 2003 Technical Memorandum.

The choice of 5% as the acceptable increment for soil and dust (compared to an increment of 0.5% for outdoor air, as described above) is based on the fact that the exposure to outdoor air is based on short term exposure that can not be influenced after the fact, while exposures to soil and dust are based on long term exposures that can, if needed, be addressed by taking cleanup actions before significant excess risk would occur.

As discussed in the December 2003 Technical Memorandum, the trigger levels for soil and dust are:

Medium	Trigger Level
Outdoor Soil	0.2% to 1%
Indoor Dust	5,000 s/cm^2

For indoor dust, 5% of 5,000 s/cm^2 is 250 s/cm^2. For outdoor soil, because the magnitude of any releases from the demolition work will be evaluated using measures of dustfall (s/cm^2), it is necessary to estimate the number of LA structures that would result in an increase of 5% x 0.2% = 0.01% (0.0001 g LA per g soil). This calculation is performed as follows:

$$\text{Dustfall } (s/cm^2) = \text{Csoil} \cdot (M \cdot D) / m$$

where:

Csoil = Concentration of LA in soil (grams per gram of soil)
M = mixing depth (cm)
D = bulk density of soil (g/cm^3)
m = average mass of an LA particle (grams LA per particle)

The depth to which asbestos particles that fall out from air would mix into soil is not known, but based on professional judgment, it is considered likely that, over time, the particles will mix to a depth of at least 0.5 cm (about ¼ inch). Assuming a typical bulk soil density of 1.5 g/cm^3, and an average asbestos particle mass of about 4E-12 g/particle (EPA 2005), the dustfall that would result in an increase of 0.01% in soil concentration is approximately:

$$\text{Dustfall} = (0.0001\ g/g)(0.5\ cm)(1.5\ g/cm^3) / (4E\text{-}12\ g/s) = 1.9E{+}07\ \text{LA}\ s/cm^2$$

In summary, the values of dustfall that will trigger the need for follow-up investigation after a demolition action are as follows:

Medium of Concern	Assessment Medium	Reference Values for Evaluating Effects of Demolition Activities
Outdoor Soil	Outdoor dustfall	1.9E+07 total ISO s/cm^2
Indoor Dust	Indoor dustfall	250 total ISO s/cm^2

Step 6. Specify Limits on Decision Errors

All estimates of environmental concentration levels are uncertain. For asbestos, analysis of air and dust samples occurs by observing and counting the number of structures on a filter that satisfy some specified set of counting rules. Thus, the basic output of the analysis is N (the number of structures), and concentration in air (s/cc) or dustfall (s/cm^2) is calculated from N. The uncertainty around any value of N is given by the Poisson distribution. In general, the relative uncertainty (the width of the uncertainty interval divided by the value of N) decreases as N increases. For the purposes of this project, the goal is to analyze samples of air and dustfall with an analytical sensitivity that would be sufficient to result in a count of about 10 asbestos structures if the true concentration is at the reference levels identified above. This can be achieved by setting the analytical sensitivity to a value 1/10 of the reference levels. Thus, the target analytical sensitivities are as follows:

Medium	Reference Level (Total ISO) for Demolition Activities	Target Analytical Sensitivity (Total ISO)
Outdoor Air	0.074 s/cc (IRIS risk model)	0.007 s/cc
	0.031 s/cc (OSWER 2003 risk model)	0.003 s/cc
Outdoor dustfall	1.9E+07 s/cm^2	1.9E+06 s/cm^2
Indoor dustfall	250 s/cm^2	25 s/cm^2

If these target analytical sensitivities are achieved, there is a high probability (>99%) that one or more LA structures will be detected in a sample if the true concentration is equal to the reference level, and the uncertainty bound around the measured concentration is likely to be smaller than a factor of 2.

Step 7. Optimize the Design for Obtaining Results

The design for monitoring potential releases of asbestos from demolition projects will be refined and improved incrementally as data become available and as information is gained on the magnitude and patterns of potential releases. For example, air and dustfall samples collected during demolition activities in 2005 and 2006 showed generally low concentrations of asbestos and indicated there was very little release to off-site locations. Based on these observations, this revision of the Work Plan (Revision 2) has been modified to reduce the fraction of samples that are initially sent for analysis.

3.0 OVERVIEW OF DEMOLITION STRATEGY

Each building selected for demolition will be evaluated individually, and a property-specific remediation plan will be prepared for each structure. Building demolitions at the Libby Site are selected mainly due to safety concerns, and therefore, removal of asbestos-containing material (ACM) is usually not feasible. In these cases, in accord with NESHAPS rules, ACM materials will generally be left in place, and a series of steps, as described in this section, will be taken to ensure that unacceptable releases to the environment are minimized and monitored. If releases do occur during demolition, appropriate follow-up investigations will be performed to ensure that any resulting soil or indoor dust levels do not exceed the EPA trigger levels specified in the December 2003 Technical Memorandum (EPA 2003).

3.1 Activities Prior to Demolition

The following sections describe activities to take place in advance of building demolition. Based on prior building demolition conducted at the Libby Site, these preparation activities are intended to establish lines of communication, as well as maintain worker safety and established cost and time schedules. In accord with standard procedures at the site, EPA will notify the Montana Department of Environmental Quality Asbestos Control Program of all planned demolitions, and nearby residents and workers will be notified of planned demolition activities by EPA's Community Information Coordinator.

3.1.1 Readiness Review

A readiness review or planning session will be held with EPA (including a Technical Assistance Unit team member), Volpe, and removal and construction oversight contractors approximately one week prior to any demolition activities in order to map out scheduling, sampling, work practices, stop order, and equipment expectations.

- ***Scheduling*** – All efforts will be made to ensure that the removal contractor's work schedule and any anticipated air monitoring scenarios are complementary.
- ***Sampling*** –The removal contractor will be informed of the nature and extent of the air monitoring scenarios planned for the project.

- ***Work Practices*** – Clear communications and expectations of removal contractor work practices and engineering controls will be established. Topics of discussion include: appropriately-sized dust suppression systems, work zones at the site to ensure worker and public safety, etc.
- ***Stop Orders*** – The removal contractor will be informed of contractual stop work orders related to factors such as wind speed, visible emissions, and total particulate detected on air samples. The following factors will trigger a stop work order:
  a) Wind speed greater than 5 miles per hour (mph) over a 5-minute average
  b) Visible emissions migrating outside of the site's exclusion zone
  c) A real-time aerosol monitor (RAM) reading greater than 5 milligrams per cubic meter (mg/m^3) over a 5-minute average. The RAM will be set to trigger an alarm when the 5-minute average exceeds a value of 2.5 mg/m^3 (one half the stopping level) to provide a margin of safety.
- ***Equipment*** – The removal contractor will provide a list of equipment to be used during demolition activities.

3.1.2 Pre-Demolition Environmental Monitoring

Meteorological

Meteorological data will be collected for a minimum of 3 consecutive days immediately prior to building demolition in order to 1) identify patterns or trends that may influence demolition activities, and 2) assist in the proper placement of upwind and downwind ambient sampling stations. Data will be collected using a meteorological (MET) station positioned at the demolition site at a distance from buildings or other features that may affect meteorological readings (such as a vortex). If the site is not of sufficient size to keep the MET instrumentation free from influencing features, the station will be placed at a height of at least 6 feet above the tallest building at the site. MET data will be downloaded and stored at the CDM Project Office in Libby.

Reference Outdoor Air and Dustfall Sampling

Reference outdoor air and outdoor dustfall samples will be collected the day immediately prior to building demolition (see Table 3-1). Assuming that access is granted, indoor dustfall samples will also be collected the day immediately prior to building demolition in 3-7 residences or businesses located near building demolition activities. The air and dustfall data collected before demolition begins will serve as a frame of reference to which samples collected during or following demolition activities may be compared.

Reference outdoor ambient air and outdoor dustfall samples will be collected at the following sampling stations:

- Two reference locations, located at least 1/4 to 1/2 mile, usually in an upwind or cross-wind direction, in an area where no impact from the demolition is expected and no other nearby cleanup activities are taking place
- The 6 monitoring stations located around the middle (perimeter) ring of stationary air monitors

For all demolition air sampling, samples will be collected using EPA method 2015, and dustfall samples (both indoor and outdoor) will be collected using method SRC-LIBBY-06. Ambient air and outdoor dustfall samples will be placed at a height about 6 feet above the ground. Section 3.4.6 provides details regarding indoor settled dust sampling requirements.

Both types of reference samples will initially be archived. If the outdoor air and dustfall samples collected from the inner and middle rings on the days of demolition indicate asbestos concentrations are present above a level of concern, these reference samples will then be analyzed. Analysis for asbestos will be performed at an offsite analytical laboratory using TEM using ISO 10312 counting rules, in accord with all relevant project-specific modifications including LB-000016, LB-000019, LB-000029, LB-000029a, LB-000030, LB-000053, and LB-000066b (CDM 2003). All asbestos structures with length ≥ 0.5 um and an aspect ratio ≥ 3:1 will be recorded. The target analytical sensitivity for air samples will be 0.001 total ISO s/cc, and the target sensitivity for both outdoor and indoor dustfall samples will be 25 s/cm^2. These levels meet or exceed the target sensitivities for air and dustfall established in the DQO section, above.

3.1.3 Pre-Demolition Material Wetting

The following procedures will be implemented at the building demolition site following the readiness review.

- If the building is considered safe for entry by removal contractor personnel, laborers will utilize a piercing tool similar or identical to that used by firefighters in order to access and wet material throughout the building.
- If the building is considered unsafe for entry by removal contractor personnel, heavy equipment will be utilized in order to access and wet material in all areas of the building.
- Amended water (water to which a surfactant has been added) will be used for all pre-demolition wetting activities. Use of surfactant–amended water decreases surface tension, increasing the ability of the water to penetrate ACM (EPA 2006).

3.2 Activities During Demolition

3.2.1 Demolition Dust Suppression

Misting Requirements

Buildings will be demolished using standard demolition techniques. Water will be sprayed on the building before and during demolition to limit the release of dust generated during the demolition process. To improve the efficacy of misting, the removal contractor will install a misting system on the excavator bucket. A man lift equipped with misters shall also be utilized for appropriate site coverage. Such systems will ensure sufficient dust suppression is initiated across the area of demolition activities. Sufficient dust suppression may be obtained through a number of means including but not limited to appropriate flow rates, fine mists, water amendments, etc. Additionally, arranging the misters above removal and demolition activities will facilitate the reaching of site problem areas to ensure adequate dust suppression.

Smallest Droplet Size
To improve the efficacy of misting, the removal contractor shall select a system which produces the smallest droplet size possible. The smaller droplets will result in coverage of a greater surface area and effectively capture any fibers migrating from the source. The use of appropriate nozzle sizes, configurations, and adequate system pressure should be considered as a means of achieving this droplet size and coverage.

3.2.2 Demolition Water Containment

Berms will be constructed around the demolition site to trap water runoff and prevent it from migrating to off-site locations.

3.2.3 Real-Time Monitoring

During demolition, three different methods will be used to monitor for conditions that might lead to excessive dust release:

a) Wind Speed. Wind speed and direction will be recorded continuously using electronic instruments. If the average wind speed exceeds 5 mph over a 5-minute average, building demolition will be halted until the wind speed decreases.
b) Dust in Air. Dust levels in air will be monitored using an array of RAMs located around the perimeter of the demolition site. If the signal from any RAM exceeds 5 mg/m^3 (the OSHA standard for nuisance dust) over a 5-minute average, demolition activities will be halted until application of water to the building reduces dust levels to an acceptable amount.
c) Visual Observation. During demolition, the pre-designated project supervisor will carefully watch for evidence of visible dust moving to off-site locations. If this occurs, the project supervisor will notify the EPA and Volpe on-site representatives and demolition activities will be halted until application of water to the building reduces levels to an acceptable amount.

3.2.4 Environmental Monitoring

During building demolition, a series of environmental samples will be collected and analyzed for asbestos. The purpose of these samples is to confirm that unacceptable releases have not occurred. If the data indicate that, despite all efforts to control release, an unacceptable release did occur, EPA and Volpe will investigate what actions are needed to clean up any properties that were impacted by the release.

The following sections describe the environmental samples that will be collected. Note that, in some cases, it may not be necessary to analyze all samples. Rather, samples will be analyzed in an "inside-out" approach, in which the samples most likely to be impacted (those closest to the demolition) are analyzed first. When the data suggest that a release has not occurred, or the boundary of a release of concern has been identified, then analysis of samples at further distances may not be necessary.

3.2.4.1 Engineering Control and Evaluation (ECE) Samples

High-volume (i.e., > 1,200 liters collected) air samples will be collected to evaluate the engineering controls and removal contractor work practices on a daily basis. Quantity and locations of ECE samples are dependent on the size and shape of the building being demolished, and therefore, will be specified in each property-specific SAP addendum. However, in general, ECE samples should be as close to the building undergoing demolition as conditions will allow. This ring should generally contain 6 monitors at a height of about 6 feet above ground level (the breathing zone for a worker), arranged at approximately equal distances around the building. In general, ECE samples will be collected once daily as outlined below, and analyzed for LA, chrysotile, and other forms of asbestos at the on-site analytical laboratory by transmission electron microscopy (TEM) using counting rules as specified in the Asbestos Hazard Emergency Response Act (AHERA) (EPA 1987). In accord with AHERA guidelines, the target sensitivity will be 0.005 AHERA s/cc. Sample results will be made available to the Site Health and Safety Officer within a 6-hour turnaround time. Such turnaround time will allow for a daily evaluation of engineering controls and work practices.

If any individual ECE sample result exceeds 2 total AHERA s/cc, the EPA and Volpe on-site representatives will be notified, and removal contractor work practices and engineering controls will be evaluated before work continues.

ECE samples will be collected from the beginning of the day's removal activities until a volume of 1,200 liters is achieved (i.e., approximately mid-morning). These samples will correspond to morning thermal and wind patterns and allow for a more thorough understanding of potential releases by correlating the sample with data relevant to its collection time. The purpose of this sample will be to determine if engineering controls in use are adequate or if adjustment to the controls is required. Because typical building tear-down activities are completed during the first morning of removal activities, a second sample will not be collected in the afternoon.

3.2.4.2 Personal Air Monitors for Workers

All workers involved in the demolition of properties at Libby will wear personal protective equipment (PPE) in accord with the health and safety plan (HASP) developed for the project. In addition, in accord with OSHA regulations, all workers involved in building demolition will wear personal air monitors that allow evaluation of the level of asbestos contamination in the air at the demolition site. These samples will be evaluated using phase contrast microscopy (PCM) within 24 hours, as described in NIOSH Method 7400. Any worker personal air sample results above the OSHA PEL (0.1 PCM s/cc) will be analyzed at a later date by AHERA counting rules, with an analytical sensitivity of 0.005

s/cc. This analytical sensitivity will be more than sufficient to confirm asbestiform minerals present and to identify any airborne levels of potential concern for short-term exposure of workers. In accord with standard site practices, air filters and microscope grids will be archived for future evaluation if necessary.

3.2.4.3 Perimeter and Off-Site Air Monitors During Demolition

At each demolition site, a series of stationary air monitors will be installed to measure asbestos levels in air at the perimeter of the property and at selected off-site locations. The exact placement of the airborne monitors will be specified on a project-specific basis, depending on the site characteristics. However, in general, the perimeter air monitoring network should consist of two concentric rings of stationary air monitors (in addition to the innermost ring of ECE monitors) (see Table 3-1), as follows:

1. The second ring will be beyond the ECE ring, usually at a distance approximately equal to the outer margin (perimeter) of the property. This ring should contain 6 monitors at a height of about 6 feet above ground level (the breathing zone of an adult resident), arranged at approximately equal distances.
2. The third ring will be located beyond the perimeter ring, at distances not to exceed approximately 300 feet. This ring should contain at least 6 monitors at a height of about 6 feet above ground level. To the extent possible, these six locations should be arranged at approximately equal distances around the third ring, but exact distances and locations may be adjusted to allow for sampling near adjacent structures of potential concern and to account for other practicalities (property access, availability of power, intervening structures, etc.).

In addition, stationary air monitors will be placed at a height of about 6 feet above the ground at two reference locations that are at least 1/4 to 1/2 mile away from the site in an area where no cleanup activities are taking place, preferably in an upwind or cross-wind direction. The purpose of these monitors is to serve as a reference for the rings of monitors around the demolition site.

Placement of all monitors will be carefully recorded using GPS and photo documentation.

This array of monitors (a minimum of 20 total) is expected to provide a reasonable characterization of the spatial pattern and extent of asbestos release. If initial studies determine that substantial releases occur as far out as the third ring, additional rings and additional monitors may be used in subsequent projects.

All stationary air monitors will be calibrated and turned on shortly before demolition activities begin, and will continue until demolition activities cease for the day. If demolition activities span more than one day, independent samples will be collected on each day.

All stationary air samples will be analyzed for asbestos, according to Table 3-1, (stratified by mineral type into LA, chrysotile, and other amphiboles) using TEM using ISO 10312 counting rules, modified to include all structures with an aspect ratio ≥ 3:1 and other modifications (refer to Libby Laboratory Modification form 16 and its updates), and will be analyzed with an analytical sensitivity of 0.001 total ISO s/cc. This analytical sensitivity is more than sufficient to detect with high confidence any airborne concentration that would be of potential inhalation concern for short-term exposure of an off-site resident to airborne releases.

Because demolition work will only occur on days when the wind is less than 5 mph, there may be no strong basis to designate stations as "up-wind" or "down-wind". For this reason, the basic approach for evaluating releases will be to compare perimeter and off-site stations results to reference stations results, focusing on patterns as a function of distance from the site. Differences between samples will be analyzed using the basic methods recommended by Nelson (1982) for comparing two Poisson rates.

3.2.4.4 Impacts to Off-Site Soils

Even if demolition activities do not cause airborne levels of asbestos to reach a level of health concern to workers or nearby residents, asbestos released in demolition dust could settle on outdoor soils at nearby properties, potentially resulting in long-term exposures of residents. As noted above, the potential for concern due to this exposure scenario might be evaluated by measuring the concentration of asbestos in soil before and after demolition. However, available methods for the analysis of asbestos in soil have only marginal sensitivity and relatively low precision, and this would likely prevent the detection of any but the largest impacts to soil. Thus, any attempt to evaluate contamination of soils would only be useful for extremely large, and unlikely, airborne asbestos releases. Because of these limitations, impacts to soil will be evaluated during building demolition by collecting and analyzing asbestos dustfall from outdoor air (SRC-LIBBY-06). This approach has the advantage that analysis of settled outdoor dust has much better sensitivity and better precision than direct analysis of soil, and the impact of the dust fallout to soil can be easily calculated.

Settled outdoor dust collectors will be set up at multiple locations around the site and used to measure the asbestos content of dust that falls out from air to soil during demolition activities. SOP SRC-LIBBY-06 describes the method for collecting and analyzing settled dust samples. The exact location of outdoor settled dust collectors may vary, but in general they will be placed in two concentric rings around the site at the same locations as the two outer rings of stationary air monitors. Dust monitors will not be placed along with the ECE monitors. Care will be taken to place the collectors in locations where they are not likely to be knocked over by workers or residents.

As noted previously, outdoor dustfall rates will also be measured at the two reference (background) stations in order to provide a frame of reference for the outdoor dustfall rates measured at the perimeter and off-site stations.

3.2.4.5 Impacts to Indoor Dust at Nearby Buildings

As discussed above, asbestos released into airborne dust during demolition activities could settle on interior surfaces in nearby buildings, potentially resulting in long-term exposures of residents or workers. The potential for concern due to this exposure scenario could be evaluated by collecting and comparing samples of dust before and after demolition, but collection of dust that settles out onto surfaces during and after demolition activities is likely to provide a much more sensitive method for quantifying the impact of dust fallout on indoor dust levels.

Settled dust will be collected in accord with SOP SRC-LIBBY-06 at indoor locations of residences and businesses located within a distance of about 300 feet of building demolition activities. As note above (see Table 3-1), if possible, samples of indoor dustfall will be collected both before and after demolition occurs (to provide a "baseline" measurement of asbestos deposition rates) as well as during the demolition period. The difference between these two samples will be used as the means for estimating the magnitude of any increase in indoor dust contamination caused by demolition. The exact location of indoor settled dust collectors may vary, but in general, collectors will be placed in buildings closest to the demolition site, with an emphasis on buildings in the downwind direction. The number of indoor dust samples to be placed in each building may vary, but in general at least two will be placed. The precise location within each building may vary, but in general the locations will be on a level surface (floor, table, etc.) located near any doors or windows that might serve as an entry point for airborne dusts.

3.2.4.6 Runoff Water

As previously noted, berms will be used to trap any water runoff from the demolition site, so migration of asbestos to off-site locations in water is not a source of concern. At demolition sites where runoff water from spraying is collected, it is expected that the water will be transported to the project landfill for disposal. In this case, there is no need to measure or analyze asbestos levels in the water. At sites where water infiltrates into soil, any impacts on the soil that remains after removal of debris and contaminated surficial soil will be evaluated as described above.

3.3 Activities Following Demolition

3.3.1 Impacts to On-Site Soils

Once building demolition is complete and debris is removed, it will be necessary to sample the soil below and adjacent to the demolition site in order to determine if the soil has become contaminated with asbestos and, if so, whether the level is acceptable to leave in place or whether soil removal is needed.

Soil samples will be collected using CDM standard operating procedure (SOP) 1-3 for surface soil sampling with project-approved modifications. Exact on-site soil sampling locations will be specified in the project-specific plan. In general, the footprint of the demolition area should be divided into 2-4 areas and a single 30-point composite collected from each area. In addition, 30-point composite samples will be collected from 2-4 locations (depending on the size of the site) that are outside the building footprint but inside the bermed area, focusing on locations where water tended to collect.

These on-site soil samples will be analyzed by PLM Method NIOSH 9002 at the onsite analytical laboratory with a maximum of 24-hour turnaround time. The soil sample results will be evaluated in accord with the current procedure for assessing surface soil (EPA 2003). As needed, soils may also be sent for preparation (SOP ISSI-LIBBY-01) and analysis by PLM-VE (SOP SRC–LIBBY-03).

3.3.2 Post-Demolition Environmental Monitoring

Outdoor air and dustfall samples (both indoor and outdoor) will be collected the day immediately following building demolition. Post-demolition sampling will not be initiated until all intrusive restoration work (e.g., backfilling or leveling of site soils) is completed. These post-demolition sampling data will serve as a reference frame in which samples collected prior to or during demolition activities may be evaluated. Ambient air and settled dust samples will be co-located at the same locations as the samples collected prior to building demolition work. These are:

- Two reference locations, located at least 1/4 to 1/2 mile, usually in an upwind or cross-wind direction, in an area where no impact from the demolition is expected and no other nearby cleanup activities are taking place
- The 6 monitoring stations located around the middle (perimeter) ring

All samples will be placed at a height about 6 feet above the ground. The samples will initially be archived. If it is determined that analysis is required, analysis will be completes at an offsite analytical laboratory using TEM using ISO 10312 counting rules, modified to include all structures with an aspect ratio $\geq$ 3:1, with an analytical sensitivity of 0.001 s/cc for air and 25 s/cm^2 for dustfall.

3.4 Sample Labeling and Identification

Samples will be labeled with index identification numbers supplied by field administrative staff, and will be signed out by the sampling teams (i.e., controlled). Sample index identification numbers will identify the samples related to building demolition activities by having the following format:

DM-#####

where: DM = Demolition-related sample
= a sequential five-digit number

3.5 Collection of Field Quality Assurance/Quality Control (QA/QC) Samples

Three types of field QA/QC samples will be collected as part of this investigation: lot blanks and field blanks for air samples and field blanks for settled dust samples.

Air Sample QA/QC

Lot blanks – Lot blanks will be required to be collected at a frequency of 1 blank per 500 cassettes as described in Libby Modification #LFO-000106. The lot blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The entire batch of cassettes will be rejected if any asbestos fiber is detected on the lot blanks.

Field blanks – One field blank will be collected during each day of air sampling and one analyzed per week, consistent with Libby Modification #LFO-000064. It is not necessary to collect separate blanks for personal and stationary air. The field blank to be analyzed will be selected at random by the CDM sample coordinator. If asbestos fibers are observed on a field blank, additional field blanks will be submitted for analysis to determine the potential impact on sample results. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis.

Dustfall Sample QA/QC

Field blanks –Field blanks for dustfall consist of a dustfall sampling container that is prepared and treated in accord with the same methods used for field samples, except that the sampler will be opened and exposed to the air for less than 30 seconds. One field blank will be collected during each day of dustfall sampling. Initially, a total of two dustfall field blanks will be selected at random for analysis by the same method as will be used for field sample analysis. If asbestos fibers are observed on either of these field blanks, additional field blanks will be submitted for analysis to determine the potential impact on sample results.

3.6 Summary of Monitoring Strategy

Table 3-1 summarizes the field and reference samples that will typically be collected as part of each demolition project in Libby.

Table 3-1
Summary of the Sampling and Analysis Strategy for Samples Collected During Building Demolition Projects in Libby

Medium	Location	No. of Stations	Time Frame			
			Pre-Demolition 1 day before demolition	During Demolition (all days)	Post-Demolition 1 day after demolition	Post-Demolition After demolition is complete
Outdoor Air	Inner Ring	6		Analyze		
	Middle Ring	6	Archive	Analyze	Archive	
	Outer Ring	6	Archive	Archive	Archive	
	Ref. locations	2	Archive	Archive	Archive	
Outdoor Dustfall	Middle Ring	6	Archive	Analyze	Archive	
	Outer Ring	6		Archive		
	Ref. locations	2	Archive	Archive	Archive	
Indoor Dustfall	Nearby buildings	variable	Archive	Archive	Archive	
On-site soil	Within footprint	2-4				Analyze
	Within bermed area	2-4				Analyze

Notes: Analyze – indicates days samples should be collected and submitted for analysis; Archive – indicates days samples will be collected and archived.

4.0 REFERENCES

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